

Utilities Master Planning in the Real World at the University of Calgary



Tom Phelps. P.E., P. Eng.
Stantec Consulting



Utilities Master Planning @ University of Calgary

- 1 University Overview
- 2 Utility Master Planning “Drivers”
- 3 The Process
- 4 Implementing the Plan
- 5 Challenges & Solutions
- 6 Q&A



1 University of Calgary Today



- 30,000 Students
- 5,000 Staff & Faculty
- 10 million SF buildings
- 24 MW electrical peak
- 200 MMBTU/hr. heating peak
- 6,600 tons cooling peak

1 University of Calgary Today

Central Heating:

High-temperature Water @ 400 F (205 C)

Central Cooling:

Chilled Water @ 42 F/54 F (5.5 C /12.2 C)

River water cooling, winter economizer

Power:

Campus-owned & operated, 13.8 kV,
fed by three delivery points, plus 14 MW
CHP



1 University of Calgary Today

Sustainability Achievements



- AASHE ranking (Feb 2017)
- #2 in Canada
- #11 in North America



- 35% reduction since 2008
- Net Zero targeted for 2050



- 27% reduction since 2008



2 Utilities Master Planning Drivers

Growth

Aging Equipment / Unfunded Upgrades

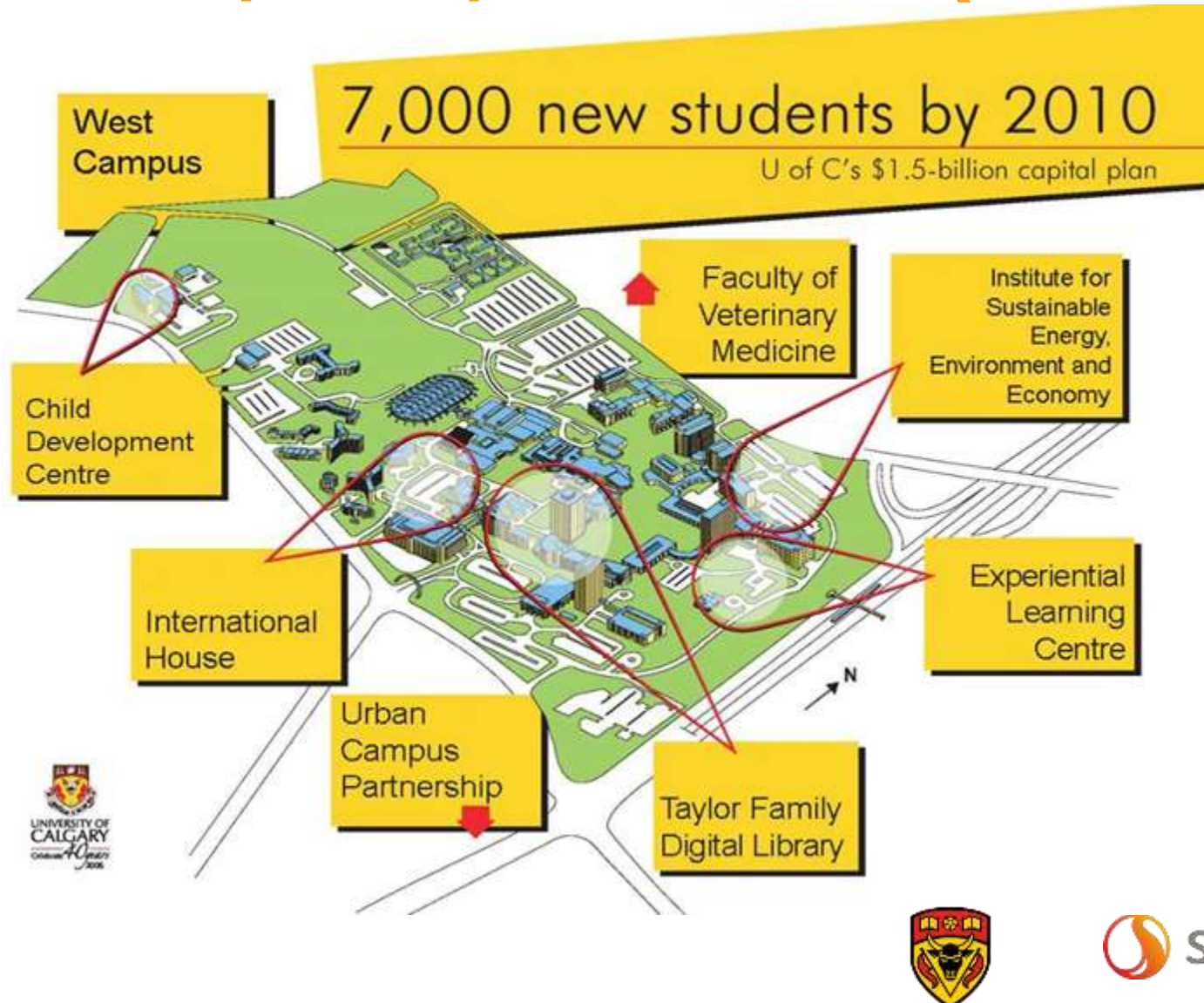
Sustainability Initiatives

Volatile Energy Markets



2 Utility Master Plan Drivers

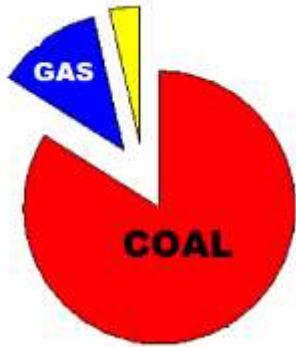
2006 Campus Expansion Plan (\$1.5 billion)



2 Utility Master Plan Drivers

Climate Initiatives

Grid Power Fuel Mix



Old Equipment

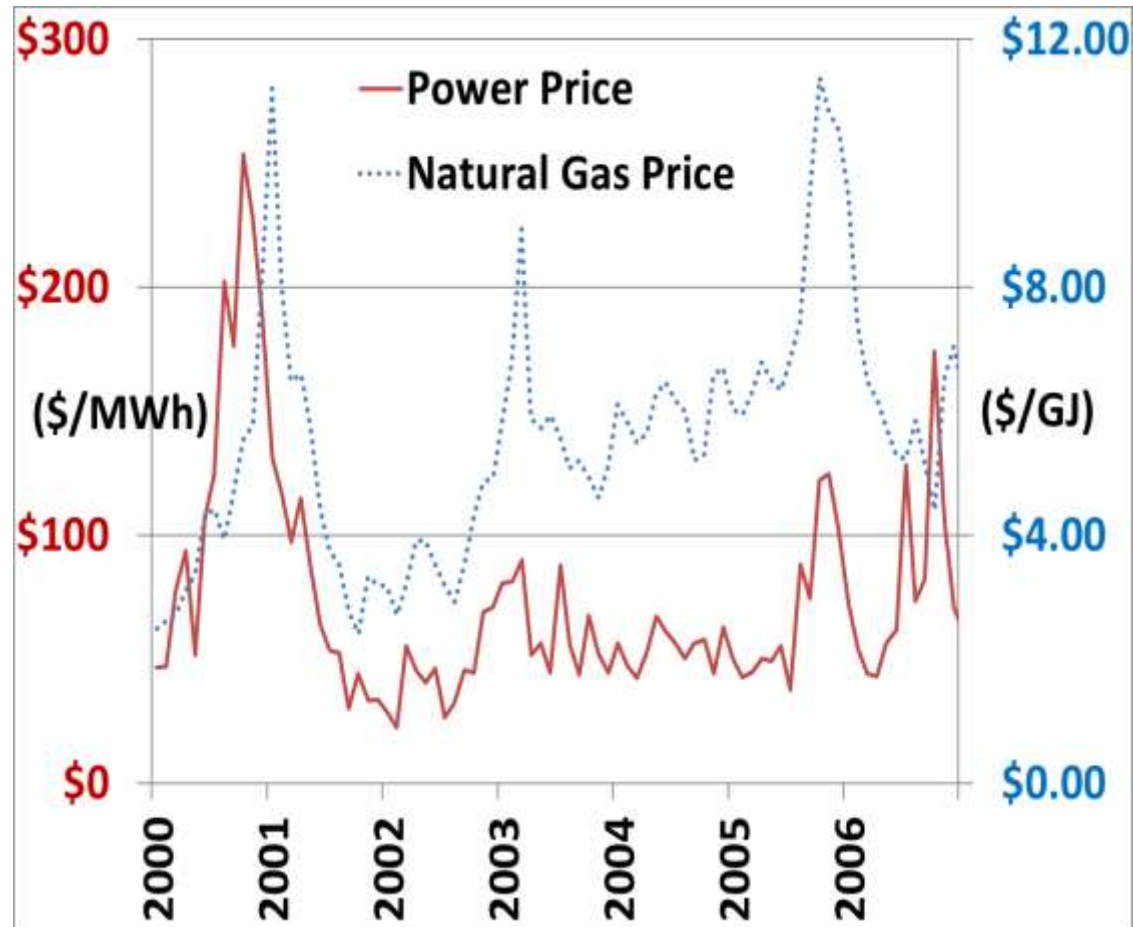
Boilers: 1966 -1972

Switchgear: 1982

SCADA: (none)

Deferred Upgrades

Energy Market Volatility



3 The Process

Condition Assessment

Deficiencies / Cost to Correct

Prioritize

Forecast: Loads, Capacity, Energy \$

Options Vetting

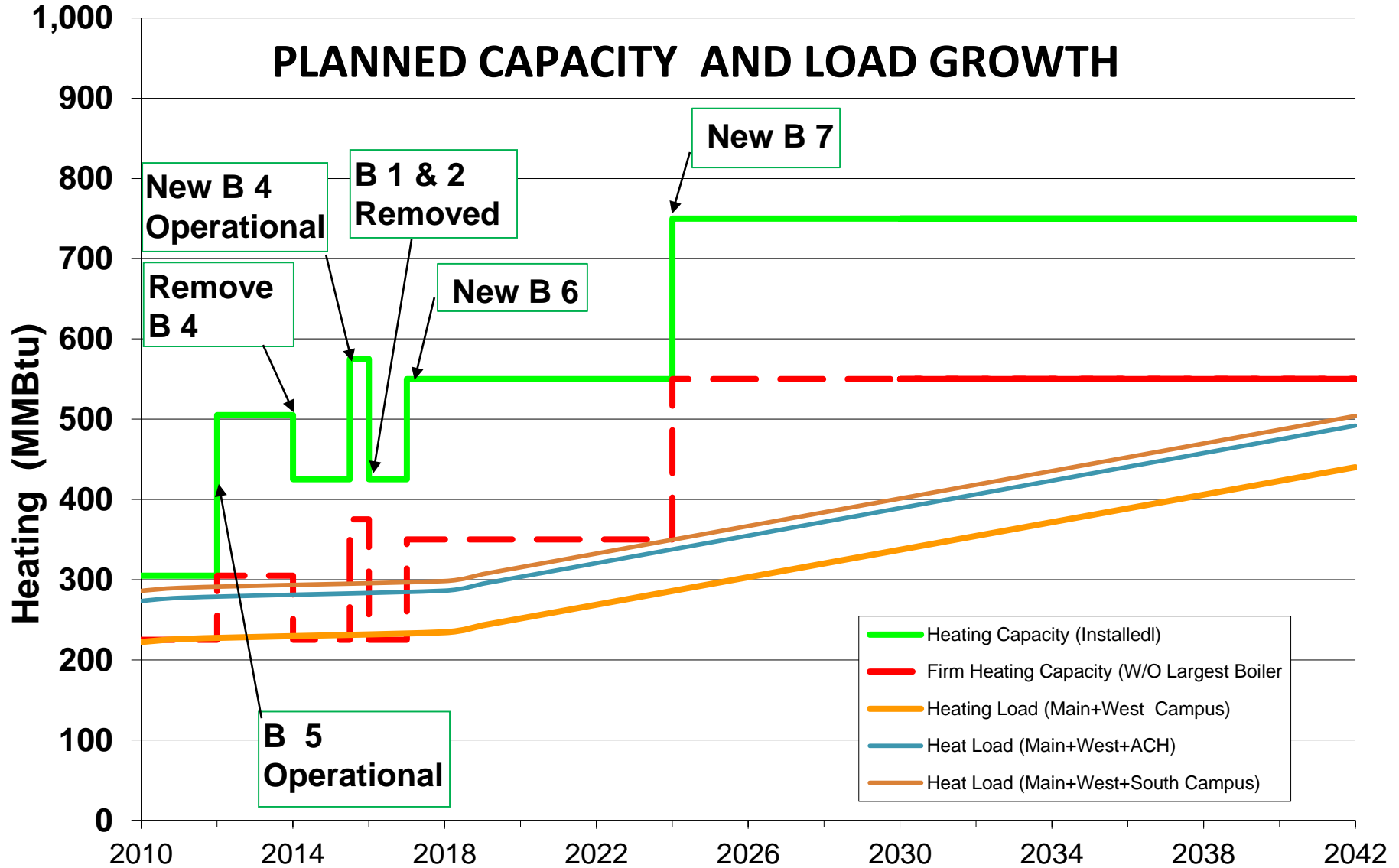
Economic Analysis

Business Case

Recommendations & Report

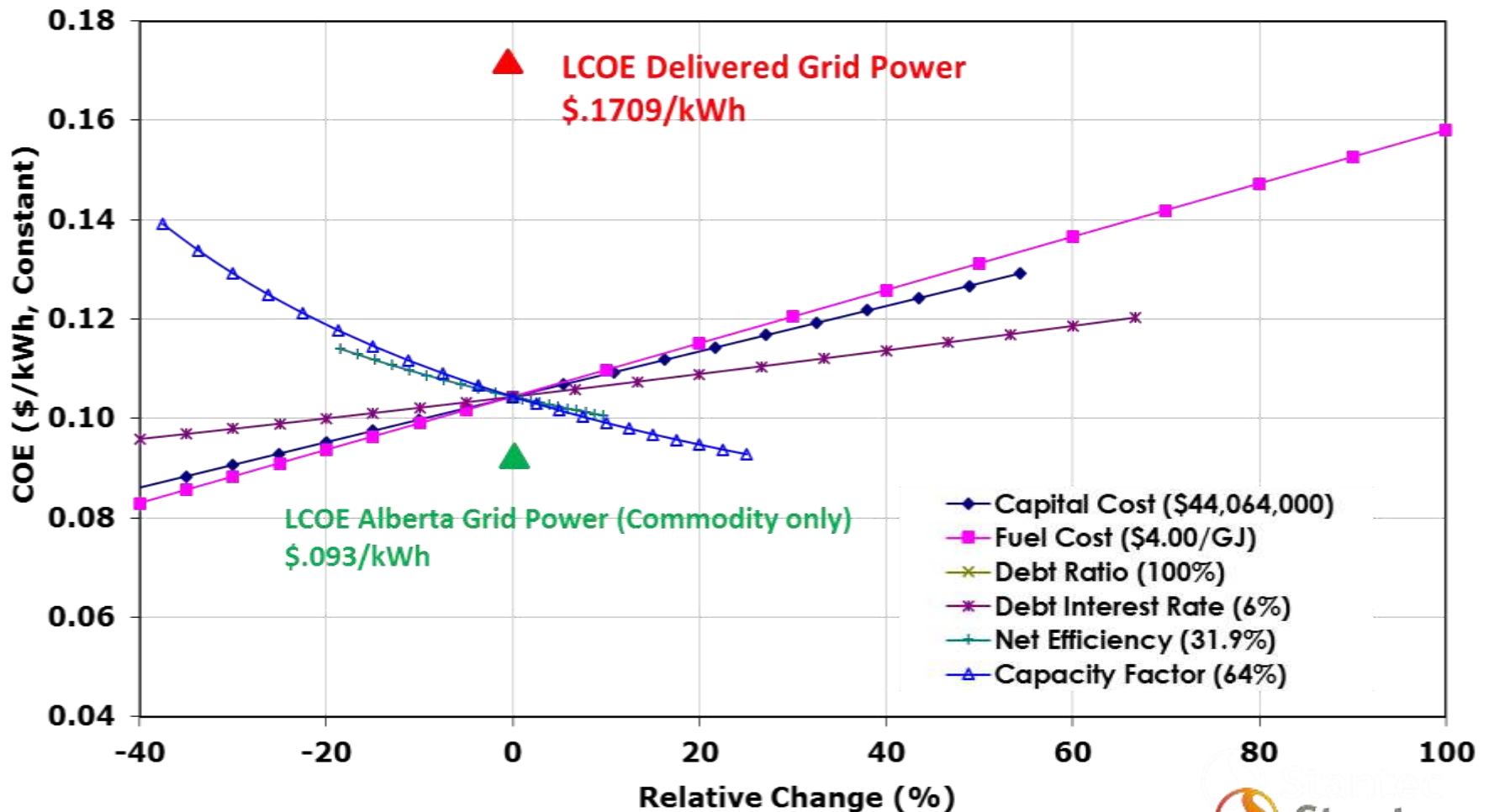
Executive Summary & Presentation





Dealing with Uncertainty

Levelized Cost of Generated Electricity (LCOE)



4 Implementing the Plan

Building Support:

- Start Early

- Business Case (Show me the money!)

- Urgency (Growth)

- Hot Buttons (Climate Action)

Persistence Pays:

- The Plan is a 'Project'

- Adapt to Changes



4 Implementing the Plan

Utility Master Planning History

Year	Scope	Amount Completed	Comments
2001	All Utilities	25%	Little urgency / buy-in Missed Opportunity
2006	Update	90%	Growth-driven Execution was a 'project'
2013	District Energy Expansion	0%	Too risky for privately- developed Campus
2018	Energy Utilities	TBD	Grid 'greening' upheaval Climate Action Planning

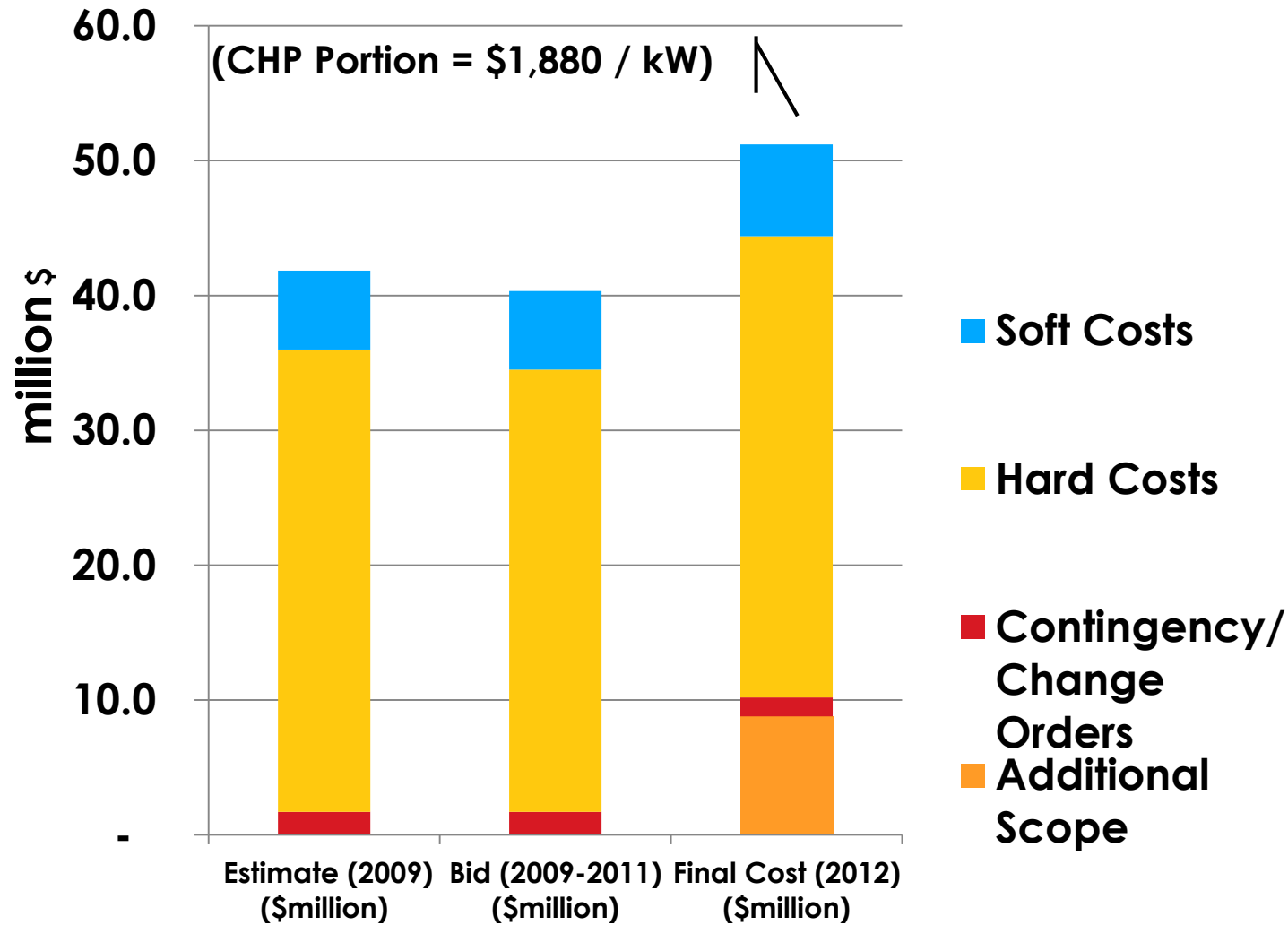


5 Challenges, Solutions, Surprises

- Building Support / Finding the Money
- Right-Sizing & Selling CHP
- 'Bundling', Project Management
Consistency in Phased Execution
- Luck = 'When preparation meets
opportunity.'



CHP Results – Capital Costs



CHP Results - Financial Performance

❑ **2012-2015 avg. Capacity Factor: 75%**

Target: 90%

❑ **3 – year Operating Savings: \$12.3 million**

❑ **3 – year Net Savings (Profit): \$5.0 million**

❑ **CHP System Cost: \$25.0 million**

Total Project Cost: \$50.0 million



'Hitting the Jackpot'



The 2009 Canadian Stimulus Package Paid Off...



Final Thoughts

“In preparing for battle, I have always found that plans are useless,but planning is indispensable.”

Dwight Eisenhower

“Luck is when preparation meets opportunity”

attributed to Seneca (4 BC-A.D. 65)



6 Questions?

Tom.phelps@Stantec.com

